

**"Ear Protector for Helmet, Helmet and Method for Protecting Ears"****Field of the Invention**

5 This invention relates to an ear protector for a helmet, a helmet and a method for protecting the ears.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

**10 Background Art**

The concept of detachable ear protection, or ear flaps, for lightweight sports helmets with head-shells cut above the ears is not new; particularly for snow sports, where ear protection is a feature of many designs of helmets currently available on the market.

15 The purpose of fitting a lightweight helmet with detachable ear flaps has primarily been to give the wearer of the helmet the option to choose between whether they wish to cover the ears for protection from the elements, or not.

20 Perforations, or simple vents, are sometimes added to such prior art ear flaps in order to allow for improved hearing when worn. Known designs are made from flexible materials or foams and are usually attached to the helmet by means of press studs, or clips, forming an extension of the helmet liner. The ear flaps are usually positioned on the inside of, and operate independently from, the helmet chinstrap, although they may share the same connection points and utilise the same components for attachment.

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Ear flaps currently used on lightweight helmets have functional limitations because of their soft, flexible, structure. They are also known to have fitting and stability problems that can compromise the level of protection and comfort they provide to the ears. Some can press against the ears to the extent that they are  
5 uncomfortable and restrict hearing. Often they are prone to disconnect or detach too easily, shifting or falling off the helmet completely, exposing the ears and side of the face.

For some time now, communications and visual devices have been attached by rudimentary means to helmets. Safety rescue, water patrol, sporting and other  
10 industries have identified the need for better methods of attaching these devices, without the requirement to modify the helmet, thereby enabling easier and more efficient utilisation of the latest technological developments. Ear flaps made of soft foam or similar material are limited in their application as a suitable platform for supporting communications and visual devices and are not currently designed to  
15 facilitate this need.

### **Disclosure of the Invention**

It is an object of this invention to overcome or at least mitigate some of the problems identified in the background art with respect to previous designs of ear flaps.

20 In accordance with one aspect of the present invention, there is provided a detachable ear protector for attachment to a helmet having a chin strap, comprising:

a support member shaped to cover an ear of a wearer of the helmet when attached thereto;

25 a rigid protective outer cover formed of material resistant to high impact and integrally formed with said support member to provide a high impact protective region covering a major portion of the support member on the outer side thereof; and

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an inner pocket formed of resilient ear contacting material attached to the inner periphery of said support member defining an inner recess to proximately accommodate the pinna of the wearer's ear within the pocket;

5 said pocket being partly attached to the side edges of said support member to define a pair of openings, one opening being disposed at the bottom of said support member and another opening being disposed at the top of said support member;

10 wherein said openings are sized to pass the chin strap therethrough so that the ear protector is positively engaged by the chin strap against the side of the head and covering the ear of the wearer, when fitted thereon.

Preferably, said support member and said outer cover are formed with juxtaposed central apertures to overlie the ear canal of the wearer; said outer cover having a rigid boss circumscribing and interconnecting said central apertures; and said boss being formed with a retentioning means to retain a central ear covering member.

15 Preferably, said ear covering member comprises a rotatable closure to selectively open and close a passage through said central apertures to facilitate hearing or access to the wearer's ear.

20 Preferably, said ear covering member comprises a housing for locating a loudspeaker of an audio system within said central apertures.

Preferably, said outer cover is formed with an outwardly projecting locating member along the top thereof, said locating member being shaped to fit within a receiving slot formed within said helmet, so that when said locating member is received therein, the ear protector is correctly aligned with the helmet.

25 Preferably, the top of the ear protector is convexly configured of complementary shape to a concave recess provided along the edge of the helmet proximate to the location of a wearer's ear, when correctly worn by the wearer, so that the ear

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protector becomes contiguous with the helmet when positively retained by the chin strap of the helmet.

Preferably, the having a triangular divided chin strap with a buckle divider

In accordance with another aspect of the present invention, there is provided a  
5 helmet having an outer protective high impact resistant shell and a resilient inner liner for accommodating the head of a wearer, the helmet comprising:

a chin strap; and

a pair of ear protectors, each ear protector being of the type as claimed in any one of claims 1 to 6.

10 Preferably, said chin strap is divided triangularly at either side with a divider buckle to attach the chin strap at two discrete attachment points to the helmet shell, one forward and the other rear, of the proximate location of the ear of a wearer when the helmet is worn, at either side of the helmet.

In accordance with a further aspect of the present invention, there is provided a  
15 method for covering the ears of a wearer of a helmet have a lower edge cut above the ears, comprising:

covering the ears with ear protectors fixed to the chin strap of the helmet; and

positively locating the ear protectors in an adjacent and juxtaposed relationship with the lower edge of the helmet directly above the ears, contiguous with the  
20 shell of the helmet.

### **Brief Description of the Drawings**

The accompanying drawings are referred to in the description of the best mode for carrying out the invention, wherein:

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Figure 1 is a three-quarter front view of the helmet fitted with ear protectors in accordance with the first embodiment;

Figure 2 is a side view of the helmet shown in Figure 1;

Figure 3 is a front view of the helmet shown in Figures 1 and 2;

5 Figure 4 is a rear view of the helmet shown in Figures 1 to 3;

Figure 5 is a front view of the helmet shown in Figures 1 to 4, but with the ear protectors removed;

Figure 6 is a side view of Figure 5;

Figure 7 is a three-quarter rear view of the helmet shown in Figures 5 and 6;

10 Figure 8A is an exploded view showing the various components of an ear protector in accordance with the first embodiment;

Figure 8B is a three-quarter outer view of the assembled ear protector shown in Figure 8A;

Figure 9A is an outer side view of the ear protector shown in Figure 8B;

15 Figure 9B is a top view of the ear protector shown in Figures 8B and 9A;

Figure 9C is an end view of the ear protector shown in Figures 8B, 9A and 9B;

Figure 9D is an inner side view of the ear protector shown in Figures 8B, 9A, 9B and 9C;

Figure 9E is a bottom view of the ear protector shown in Figures 8B, 9A, 9B, 9C,  
20 9D and 9E;

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Figures 10A, 10B and 10C are three consecutive side views of a helmet showing an ear protector being progressively passed through a chin strap and fitted into position contiguously with the helmet to cover the ears of a wearer of the helmet;

5 Figures 11A to 11B are a series of five consecutive views showing an ear protector being progressively passed through a chin strap and fitted into position contiguously with the helmet to cover the ears of a wearer of the helmet; whereby Figures 11A and 11B show the inner side of the ear protector as it is being positioned, Figures 11C and 11D show the outer side of the ear protector as it is being positioned, and Figure 11E shows the relative position of the divider buckle  
10 with respect to the bottom of the ear protector when positioned at its operative location;

Figure 12 is a three-quarter front view, similar to Figure 1, but shaded, and showing an Inset of the relative location of the divider buckle and bottom of the ear protector when positioned at its operative location, magnified;

15 Figure 13A is an exploded view showing the various components of an ear protector in accordance with the second embodiment; and

Figure 13B is a three-quarter outer view of the assembled ear protector shown in Figure 13A.

### **Best Mode(s) for Carrying Out the Invention**

20 The best mode of the invention is described with respect to two embodiments of the invention. Both embodiments are directed towards an ear protector and helmet.

The first embodiment is described with reference to Figures 1 to 12 and involves an ear protector having an ear covering member in the form of a rotatable closure  
25 to selectively open and close a passage through the ear protector to facilitate hearing or access to the wearer's ear.

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As shown in the drawings, the first embodiment comprises a helmet 11 and an ear protector 13.

The helmet comprises an outer shell 15 formed of high impact resistant material, such as polycarbonate or ASA plastic. The helmet is formed with an inner liner 17  
5 formed of a resilient water proof material, such as closed cell soft foam suitable for comfortable contact with, and support of, the head of a wearer of the helmet. The inner liner may be formed of eva (ethyl vinyl acetate), which is thermoformable by the application of heat and pressure, or santaprene, which is injection mouldable.

10 The helmet 11 has a "high-cut" over where the ears of a wearer would situate when worn, forming a concave recess 19, which is best shown in Figures 5 to 7 where the ear protectors 13 are removed.

The helmet 11 also optionally has a high-cut shell over the forehead of a wearer, which is covered by an elasticised head band 21 integrally formed with the  
15 helmet, as best shown in Figures 1, 2, 3, 5, 6 and 12. Alternatively, the shell of the helmet 11 may extend forwardly to cover the forehead, as best shown in Figures 10.

Vents 23 are formed at prescribed locations of the shell 15 and head band 21 of the helmet 11 to provide for ventilation of the head of the wearer and ingress and  
20 egress of water in the case of the helmet being used for water sports.

The helmet 11 is also provided with a chin strap 25 and two helmet attaching straps, one attaching strap 25a being attached to one side of the helmet, and the other attaching strap 25b being attached to the other side of the helmet. Both attaching straps are connected to opposing connectors of a buckle 27 via a  
25 divider 29.

The chin strap 25 and helmet attaching straps 25a and 25b are arranged in the standard triangular attachment configuration, where each divider 29 is threaded by each helmet attaching strap to divide the strap into two discrete helmet

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attaching portions 31, the ends of each helmet attaching portion being anchored by a pin 33 to the side of the helmet shell 15. One helmet attaching portion 31a of a helmet attaching strap is anchored forward of the concave recess 19, and the other helmet attaching portion 31b is anchored rearward of the concave recess. in  
5 this manner, the straps may repose about the head of a wearer, either side of where the wearer's ear would be located for comfortable and positive retention of the helmet to the wearer's head when the buckle 27 is fastened.

The ear protector 13 comprises a support member 35, a rigid protective outer cover 37 and an inner pocket 39.

10 The support member 35 and pocket 39 are formed of similar material to the liner 17, and the outer cover 37 is formed of similar material to the shell 15.

The support member 35 is shaped to completely cover the ear of a wearer when fitted to the helmet and forms a base to which the outer cover 37 and the pocket 39 are attached. The top of the support member 35 is convexly contoured to  
15 complement the shape of the concave recess 19 and move hingedly laterally of the helmet, relative to the shell 15. The support member 35 is also formed with a central aperture to overlie the ear canal of the wearer, when operatively positioned with respect to the shell.

The outer cover 37 is an annular dome shape, the radius of the outer  
20 circumference thereof describing an upper arcuate portion of marginally larger radius than the top of the support member 35, and a lower arcuate portion of marginally smaller radius than the corresponding bottom of the support member. The outer cover 37 is similarly provided with a central aperture concentric and juxtaposed with the central aperture of the support member 35 to maintain the  
25 opening through the ear protector to the ear of the wearer.

A rigid boss 41 comprising a radial, outer flange 41a and an axial spigot portion 41b circumscribes the central apertures of the support member 35 and outer cover 37 and keys with the inner periphery 43 of the central aperture of the outer cover to pinch the support member in juxtaposed relationship with the outer cover



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37. As shown, the outer flange 41a is disposed on the inner side of the support member 35, and the spigot portion 41b is formed with external locating lugs 45 to frictionally engage corresponding locating grooves 47 provided on the inner periphery 43 of the outer cover 37.

- 5 A central ear covering member 49 of corresponding size and shape to the central aperture of the boss 41 is provided with a series of protruding locking fingers 51 to mate with a series of locking grooves 53 formed within the inner circumference of the boss. The fingers 51 and locking grooves 53 form corresponding parts of a retentioning means to fixedly situate the covering member 49 within the central
- 10 aperture of the boss 41. Moreover, the covering member 49 is fitted to the outside of the outer cover 37 and the locking fingers 51 engaged with the locking grooves 53. The covering member 49 is then rotated clockwise into a locked position where the fingers 51 are retained within recesses 53a formed within each locking groove 53, holding the support member 35 and the outer cover 37 firmly together.
- 15 The covering member 49 in the present embodiment is provided with a pair of diametrically opposed vents 55 and a rotatable closure 57 formed with corresponding holes 59. The closure 57 is pinned to the centre of the covering member and is adapted to rotate between an open position where the vents 55 and the holes 59 are aligned to allow access through the central apertures, and a
- 20 closed position where the vents and the holes are closed by the radially intervening portions of the covering member 49 and the closure 57 obscuring the holes 59 and vents 55, respectively.

The pocket 39 is attached to the outer periphery of the support member 35, on the inner side thereof. A large inner recess 61 is centrally formed within the pocket 39

25 to proximately accommodate the pinna of the wearer's ear within the pocket when the ear protector is operatively positioned with respect to the shell 15 and expose the central aperture of the boss 41 on the inner side of the ear protector. The pocket 39 is attached to the side edges of the support member 35 and a portion of the bottom edge thereof, so that a comparatively small opening in the form of a

30 slot 63 is provided at the bottom of the ear protector and a major opening 65 along the top, between the support member 35 and the pocket 39. The slot 63 is

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sufficiently large to allow the buckle 27 and the divider 29 of a chin strap to pass therethrough.

The pocket forms a thickened U-shaped portion 67 to circumscribe the sides and bottom of the inner recess 61, and a thin arcuate web 69 recessed itself to  
5 similarly circumscribe the top of the inner recess 61, but also accommodate the top of the pinna of a helmet wearer that may protrude beyond the inner recess 61.

The top of the outer cover 37 is formed with an outwardly projecting locating tab 71 integral therewith. The locating tab 71 is shaped to fit within a receiving slot (not shown) formed between the inner liner 17 and the shell 15 of the helmet, at  
10 the apex of the concave recess 19. The distal end of the locating tab 71 is formed with a spigot 73 to sit within a complementary shaped well within the receiving slot, so that when said locating member is received therein, the ear protector 13 is correctly aligned and hingedly retained with respect to the helmet.

Now describing the manner of operatively locating each ear protector 13 relative  
15 to the helmet 11, reference will be made to Figures 10A to 10C, Figures 11A to 11E and Figure 12.

As shown in Figures 10A and 11A, the ear protector 13 is initially located so that the top of thereof is adjacent to the buckle end of the particular strap half to which the ear protector is to be fitted. Obviously, the inner side and outer side of the ear  
20 protector is relatively disposed to adopt the corresponding inner and outer sides of the helmet at the particular side of the helmet to which the protector is being fitted.

The buckle 27 is then pushed through the major opening 65 into the inside of the pocket 39 as shown in Figure 10B and then is worked through the slot 63 as shown in Figures 11B and 11C. The divider 29 follows the buckle 27 and is  
25 similarly passed through the major opening 65 and eventually the slot 63 to project therefrom at the bottom of the ear protector, as shown in Figures 10C, 11D and 11E. As the divider 29 is passed through the slot, the locating tab 71 is inserted into the receiving slot therefor within the helmet and the spigot 73 seated

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within the well. At this position, the top of the outer cover 37 is seated snugly within the concave recess 19 to be contiguous with the contour of the shell 15.

Importantly, each ear protector is sized and each divider 29 is located distally from the shell a distance commensurate to the axial extent of the ear protector 13, 5 between the top and bottom thereof. Furthermore, the divider 29 is formed so that the upper edge thereof can accommodate the adjoining portion of the bottom of the support member 35 between it and the corresponding helmet attaching straps, as shown in the Figure 12. In this manner, when the ear protector 13 is located in an operative position, it is retained snugly between the corresponding divider and 10 adjacent concave recess of the shell and is integrally formed with the helmet attaching straps to be positively retained in position thereby.

The second embodiment is substantially similar to the first embodiment, except that the central ear covering member 49 accommodates a speaker housing for an audio system instead of vents. In describing the second embodiment, the same 15 base reference numerals will be used for like components previously described in the first embodiment, except that all reference numerals will be designated with '.

As shown in Figure 13 of the drawings, the covering member 49' incorporates a water proof loudspeaker housing 101' formed of pliable material, within which a loudspeaker (not shown) is disposed.

20 The housing 101' is formed with corresponding locking fingers 51' to engage the locking grooves 53' provided in the central aperture of the boss 41' and be rotated into locked position within the recesses 53a'. Accordingly, the speaker housing 101' is fixedly attached to the ear protector 13' in corresponding manner to the vents of the first embodiment. The loudspeaker therein can be connected by wire 25 or wireless means to an audio receiver or player located on the rear of the helmet or elsewhere on the person of the wearer to deliver audio signals via the loudspeaker to the wearer.

This particular embodiment is ideal for providing a two-way communication system with appropriate location of a microphone on the helmet.

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It should be appreciated that both embodiments incorporate features that overcome the limitations of current helmet ear flaps. When the ear protectors are fitted to a lightweight helmet, the combination provides a more versatile helmet that is suitable for a wider range of sport and industrial applications because the  
5 ear protectors are designed to perform as an extension of the helmet shell. The ear protectors not only protect the ears, but also provide a stable support member that permits the attachment of communication systems and other devices in proximity to the ears of a wearer.

10 In the case of communication systems, these have previously only be achievable with the addition of bulky headsets or similar apparatus. The present embodiments offer a method of attachment and a speaker housing that retains a compact, close fitting helmet profile.

The rigid plastic outer cover of the ear protector provides an increased level of safety protection to the ears, when compared to helmet flaps made from softer  
15 materials. A soft foam lining fitted to the outer cover to form a generous ear pocket achieves a superior, more comfortable fit, which is further enhanced by the hinging effect at the join between the ear protector and the mating helmet contours, providing better accommodation of varying head shapes than a full helmet shell with ear coverage. The enclosure of the upper portion of the chin  
20 strap inside the ear protector and the locating tab provided on the outer cover, ensures that the entire unit remains stable and secure when positioned over the ears.

The provision of the audio vent system of the first embodiment, permits adjustment between a closed position where the elements (wind, water, cold) may  
25 be shut out from direct contact with the ears, and a fully opened position allowing increased audibility to the wearer's surroundings.

The retentioning system used for the ear covering member provides means for the attachment of not only a variety of different communications and music devices, but also a connection facility for altimeters, cameras and the like.

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The attachment of the ear protector and audio system results in a complete head protection unit that has the stability and performance benefits of full shell helmet coverage. Furthermore, the advantages of easy detachment to a helmet designed with a cut above the ears allows tremendous flexibility in helmet use, maintaining  
5 comfort features to suit a variety of different environments.

It should be appreciated that the scope of the present invention is not limited to the particular embodiments described herein.